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Lean project delivery: A winning strategy for construction and real estate development

By Joseph A. Cleves Jr. and John F. Michel

Even in the most robust economy, the challenges involved in construction can be enormous. Owners commonly complain about timeliness, high costs and substandard performance. Architects, builders, subcontractors and other players are often insufficiently coordinated to deliver the finished product within budget and on time. Safety is also a huge concern.

To address these issues, a number of builders are embracing lean project delivery, a new construction management model inspired by the Toyota Production System (TPS). This approach focuses on producing value without generating waste; it requires close coordination among all workers to meet customers' needs within tight time frames.

A key driver of the lean project delivery approach is understanding that rewards and compensation are tied to the value of the completed project as a whole. Individual players are expected to pitch in and help to correct problems other players are having, even if it means cross-disciplinary work. The team decides how to correct problems based upon maximizing value to the owner, and upon minimizing detrimental impact on other portions of the project.

While lean project delivery is a relatively new concept in the construction industry, it is becoming prevalent in the United States, the UK, Denmark, Finland, Australia, Brazil, Chile and Peru (Ballard and Howell, 2003). In Peru, for example, one contracting company increased profits by $3 million on its first nine projects by employing lean project delivery.

Lean project delivery embraces cooperation by forming a team in which the architect, builder and all other critical players in the project are treated as equals on a single team in the pursuit of shared goals.

Toyota's innovative approach

Lean project delivery is based on TPS, which is founded on 14 key principles (Liker, 2004):

1. Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals.
2. Create a continuous process flow to bring problems to the surface.
3. Use "pull" systems to avoid overproduction.
4. Level out the workload.
5. Build a culture of stopping to fix problems. Get quality right the first time.
6. Standardized tasks are the foundation for continuous improvement and employee empowerment.
7. Use visual control, so no problems are hidden.
8. Use only reliable, thoroughly tested technology that serves your people and your process.
9. Grow leaders who thoroughly understand the work, live the philosophy and teach it to others.
10. Develop exceptional people and teams who follow your company's philosophy.
11. Respect your extended network of partners and suppliers by challenging them and helping them to improve.
12. Go see for yourself to thoroughly understand the situation.
13. Make decisions slowly, by consensus, thoroughly considering all options. Then, implement decisions rapidly.
14. Become a learning organization through relentless reflection and continuous improvement.

TPS is driven by the belief that the processes drive the results, not the other way around.

TPS focuses on eliminating problems before they occur by encouraging workers to stop production if they find a defect. Under the conventional approach, individual production units lack sufficient incentives to report a defect since no one wants to be the bearer of bad news. Ironically, although TPS encourages employees to deliver bad news to their managers, this approach actually increases morale because employees are given more control over production. As a consequence, they are able to produce better quality products.

Another key factor to the success of the TPS model is the elimination of waste by pulling inventory. Required materials are pulled only when they are needed; this avoids overproduction. The most widely used lean manufacturing technique for pulling inventory is the just-in-time (JIT) delivery technique. This technique ensures that the necessary material is where it needs to be in the necessary amount at just the right time.

Relentless reflection is utilized in TPS in order to continually improve. This approach focuses more on process than on end result; TPS is driven by the belief that the processes drive the results, not the other way around. The reflection process seeks out the root cause of the problem so that it can be evaluated and corrected.

Design and construction applications

The emphasis on teamwork and cooperation is evident in some emerging trends in the construction industry. One recent trend is the design-build model of construction management, where builder and designer work together to meet client goals. Lean project delivery takes this cooperation to the next level by forming a team in which the architect, builder and all other critical players in the project are treated as equals on a single team.

A popular first step toward this in the construction context is the use of the Last Planner System® (LPS). Developed by the Lean Construction Institute, LPS focuses on establishing in advance relationships of trust and commitment among all players with a role in the project. LPS helps the various players focus on their reliability in meeting the commitments they make. When more companies reliably meet their commitments, the overall project proceeds more smoothly. This avoids the inefficiencies that result when individual team members look only to their own business entity's productivity and profit, at the expense of the total project.

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LPS begins with formation of the core group. The core group normally comprises the owner, builder and architect. The core group then selects and invites additional members, such as engineers, subcontractors and material suppliers. These members have expertise that could help improve the project's ability to meet the owner's needs. As a result, tight production coordination occurs among designers and builders from the outset — often a weak link under the traditional approach. LPS requires extensive advance planning, including (1) the identification of major project milestones, (2) reverse phase scheduling between those milestones to identify handoffs of work among companies, and (3) forward-looking planning to determine what must be accomplished to achieve those handoffs (Lean Constraction Institution 2006).

LPS then involves weekly or daily meetings to obtain from the "last planners" promises that can be performed fully and in a timely way. If last planners are unable to complete their work as promised, the team will work together to identify and remove the constraints to completing work as planned. Furthermore, if team members are not confident they can perform on time, they are expected to be open and frank about their concerns, so the team can collaboratively address these problems in advance.

Essentially, LPS replaces *optimistic* planning with *realistic* planning by evaluating whether workers can actually deliver on promised results and deadlines. When done effectively, projects cost less and take less time for delivery, increased quality and increased safety.

Relational contracts

California attorney William Lichtig proposes "relational contracts" as a way to implement lean project delivery. Relational contracts involve a philosophical change from traditional construction contracts. The traditional approach involves binding specific individuals to specific tasks. This approach separates owner, designer, builder, subcontractor and supplier into discrete worlds that interact only through a series of transactions including contractual payments, deliveries and allocation of risks.

Relational contracts create a system of cooperation, and shared responsibility, rewards and risk, all tied to the amount of value generated by the end product.

Initially the contract establishes the relationships within the core group, and subsequently adds members to the team through "joining agreements."

Primary elements of a relational contract should include the following:

- A statement outlining the project planning system, whether LPS or an equivalent
- The assignment of a cross-disciplinary group of senior executive representatives to oversee the group and foster a collaborative environment
- A statement that clearly expresses the goals of the integrated team and the importance of each member's contribution to the overall result
- The call for a "target value design" plan stating how project participants work collectively to design to a target value as defined by the owner (Ballard and Reiser, 2004). Thus, the agreement should also implement systems to determine whether targeted value objectives are actually met.
- A call for the development of a quality plan that communicates expectations to front-line workers. The plan should empower workers to stop the production line if they determine their work does not meet overall project objectives.
- An agreed-upon formula for the distribution of gross profits to the team members at the end of the project. This may include an incentive sharing plan (funded with project savings) to encourage superior performance based on lean project delivery goals.

As construction companies institute the concepts of lean construction, the inventory levels, project lengths and budget variances are all expected to decrease.

Favorable impact on financial statement audit scope

This can also have a favorable impact on the scope and cost of a financial statement audit.

As inventory levels decrease, the balances become less material to the construction company's financial statements as a whole. As inventories become less material, auditors lower the level of attention and time given to these balances, due to the decreased level of risk they represent. Lower inventory balances are also likely to diminish the need for auditor site visits, lowering costs even further.

In addition to the benefits presented by lower inventory levels, shorter project lengths can also have a favorable impact on audit scope and costs. As projects take shorter periods to complete, the likelihood that these projects will be in place at the end of one or more audit periods is decreased. This can lower the scope of the associated financial statement audit procedures by eliminating the testing needed for balance sheet amounts associated with these projects.

Lean construction can be expected to decrease the instances and size of budget variances, providing another area where scope and cost of a financial statement audit are positively impacted. Most financial statement auditors and construction companies view the use and monitoring of budgets as a key control over the accounting of project costs and revenues. Decreasing the instances and size of budget variances provides additional evidence to the financial statement auditor that this key control is working effectively. This can decrease audit time and scope by decreasing the time spent by auditors in investigating the cause and impact of budget variances. Decreasing audit time and cost also decreases the time spent by company personnel on audit-related matters.

Most construction contractors use the Percentage Completion Method for revenue recognition on long-term construction contracts. A long-term contract is a contract started in one year and completed in a later year. This method of accounting is heavily reliant on estimates of cost incurred to date, relative to total estimated costs, to determine revenue recognition. The more estimating that is required, the less reliable the financial results. The longer the duration of the contract, the more uncertainty there is of the ultimate financial outcome of the contract. LPS can counteract the tendency toward long-duration contracts.

Tax advantages

Activities undertaken by a taxpayer for design or improvement of production processes may give rise to research expenditures that translate into a 20 percent credit against federal income taxes of a taxpayer. A taxpayer's research expenditures that are not creditworthy may nonetheless be deductible against taxable income.

For expenditures related to qualified research activities to be credit eligible, the underlying activity must be a qualified research activity. This is a four-part test:

- Is it intended to be useful in the development of a new or improved business component of the taxpayer? A business component includes a product, process, technique, formula, invention or software.
- Does the activity eliminate uncertainty related to capability, methodology or appropriateness of design? Uncertainty is particularly important with respect to the analysis performed before the activity is started.
- Is it technological in nature, i.e., undertaken to discover information that relies on the principles of science? This includes physical or biological science, engineering or computer science.
- Does it involve a process of experimentation designed to evaluate one or more alternatives?

Qualified research expenditures arise if they relate to a qualified research activity. Expenditures incurred by a taxpayer that may give rise to a credit include wages, supplies and amounts paid for contract research. Thus the U.S. tax law might actually subsidize the efforts undertaken in pursuit of lean project delivery.

Governance implications

Lean construction techniques often require additional attention to the detail and quality of internal controls, as well as an increase in the number of controls. The issue is a practical, operational one in that the benefits associated with the lean concept cannot be fully realized if purchases and deliveries of materials, for example, are not done in a very timely manner. This, in turn, increases pressure and risk on the full project supply chain.

Another area of concern from a controls perspective is labor, especially highly skilled labor associated with point inspections. These experts have to be on time. It may be beneficial to provide preview information packets in a structured manner to allow them to rapidly review, inspect and conclude so no time is lost in this part of the process.

The term "lean" connotes less. But in practice, lean likely requires more of an internal controls and governance infrastructure. This is because tolerances and timelines are pushed increasingly hard to achieve efficiencies. This enhanced infrastructure enables management to analyze and control the processes more effectively, head off potential problems and realize gains.

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Looking ahead

Construction professionals have much to gain from adopting aspects of Toyota's lean production methods. The collaborative approach produces shared value without generating waste, requiring tight coordination among all workers, and meeting customers' needs within a tight time frame. By fostering this type of productive collaboration and coordination among team members, lean project delivery promises to make construction contracting more of a win-win proposition for everyone involved. •

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